

REMARKS

In the Final office action mailed April 6, 2004, claims 34-60 were rejected under 35 USC §103(a) as being unpatentable over the admitted prior art (U.S. Patent 5,911,619 Uzoh et al.) in view of U.S. Patent 6,179,691 to Lee et al.

§103

Claims 34-65 were rejected under §103 as obvious in view of admitted prior art and Lee et al. Under the Graham test, three factors must be evaluated: the scope and content of the prior art; the differences between the prior art and the claimed invention; and the level of ordinary skill in the art. (MPEP 706 and 2141 et seq.). Even if the combination of the reference taught every element of the claimed invention, without a motivation to combine, a rejection based on a *prima facie* case of obvious is improper. The level of skill in the art cannot be relied upon to provide the suggestion to combine references.

The Examiner indicates that “Lee is relied upon to teach the detection method, which as one of ordinary skill in the art would recognize, is suitable for detecting a planarization process in the presence of a workpiece surface influencing device even if the process uses only a minimal amount of CMP”.

Without the prior art suggestion the desirability of the claimed invention, mere fact that references can be combined or modified is not sufficient to establish *prima facie* obviousness. Stating that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness. Even if the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish obviousness without some objective reason to combine the teachings of the references. The level of skill in the art cannot be relied upon to provide the suggestion to combine references.

Nonetheless, the Office action asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention to use the detection method of Lee et al. to detect planarization of the surface being planarized in the method of the instant application since Lee et al. teach that the disclosed optical detection method is suitable for determining planarization of a conductive (copper) layer deposited on a substrate employing a work-piece surface influencing device. It is improper to rely upon the level of skill in the art to provide the suggestion to combine references without finding as to the principle or specific understanding within the knowledge of a skilled artisan that would have motivated the skilled artisan to make the claimed invention. In this

case, there is no finding that would have provided the motivation to use an endpoint detection method of Lee et al. in combination with a deposition and planarization apparatus of Uzoh et al. that uses a workpiece surface influencing device.

Moreover, Lee et al. disclose a method of endpoint detection for copper CMP (chemical mechanical polishing). The CMP process removes an already deposited metal layer. The CMP removal process is not concerned with material deposition or planarization but with endpoint detection to determine the lack thereof a layer of copper. In contrast, the present invention recites a method of detecting the degree of planarization of a material being deposited.

For example, independent claim 34 recites:

... depositing the conductor to fill features within the top surface of the workpiece using electrochemical mechanical deposition employing a workpiece surface influencing device, an applied potential and the solution;

transmitting a beam of light onto the top surface of the workpiece to obtain a reflected beam of light, a characteristic of the reflected beam of light being altered by a top surface pattern that exists due to the features within the top surface of the workpiece; and

detecting a change in the characteristic of the reflected beam of light indicative of a degree of planarization to the top surface of the workpiece.

Claim 34 recites a unique combination that includes depositing the conductor to fill features with a workpiece surface influencing device, an applied potential and the solution using electrochemical mechanical deposition, transmitting a beam of light to obtain a reflected beam of light, and detecting the reflected beam of light indicative of a degree of planarization to the top surface. The recitation of independent claim 34 is neither taught nor suggested by the references alone or in combination. Accordingly, claim 34 is patentable over the references.

Independent claim 45 is patentable over the references. Claim 45 recites electrochemically mechanically processing the top surface of the workpiece using a workpiece influencing device, an applied potential and the solution to deposit material onto the top surface, transmitting a beam of light onto the top surface of the workpiece to obtain a reflected beam of light, and detecting a change in a characteristic of the reflected beam of light indicative of a degree of planarization to the top surface of the workpiece. Lee et al. discloses a method of endpoint detection for copper CMP. To contradistinguish, the CMP removal process of Lee et al. is not concerned with material deposition or detecting a degree of planarization but with endpoint detection signaling the lack thereof a layer of copper. In contrast, independent claim 45 is concerned with detecting the degree of planarization while material is being deposited to the top surface of the workpiece.

Accordingly, the recitation of claim 45 is neither taught nor suggested by the references alone or in combination. Claim 45 is patentable over the references.

Independent claim 52 is patentable over the references. Claim 52 recites depositing the conductor to fill the features within the top surface of the workpiece, and obtaining a signal indicative of a degree of planarity of the top surface. Lee et al. discloses a method of endpoint detection for copper CMP. The CMP removal process of Lee et al. is not concerned with material deposition or detecting a degree of planarization but endpoint detection to determine the lack thereof a layer of copper. In contrast, independent claim 52 recites a method detecting the degree of planarization to the top surface of the workpiece while material is being deposited. Accordingly, the recitation of independent claim 52 is neither taught nor suggested by the references alone or in combination. Claim 52 is patentable over the references.

Applicants submit that since the independent claims are not taught or suggested by the references, that the dependent claims are also allowable over the references. Moreover, all words in a claim must be considered in judging the patentability of that claim against the prior art. If an independent claim is non-obvious under 35 U.S.C. § 103, then any claim depending therefrom is non-obvious. Accordingly, applicants respectively request that the 35 USC §103(a) rejection be withdrawn and that the claims be allowed.

Claim 51 depends from independent claim 42 and is patentable by its dependence on independent claim 42. Claim 51 further recites that portions of the top surface is conductive and the step of electrochemically mechanically processing deposits a conductor into features disposed in the top surface of the workpiece.

Claim 53 depends from independent claim 52 and is patentable by its dependence on independent claim 52. Claim 52 further recites that transmitting and detecting a beam of light and transforming the characteristic into a signal which corresponds to the degree of planarity of the top surface.

Claim 35 depends from independent claim 34 and is patentable by its dependence on independent claim 34 and its further recitation of terminating the electrochemical mechanical deposition at a predetermined degree of planarization.

Claim 46 depends from independent claim 45 and is patentable by its dependence on independent claim 45 and its further recitation of terminating the electrochemical mechanical process at a predetermined degree of planarization of the top surface.

Claim 54 depends from independent claim 52 and is patentable by its dependence on independent claim 52 and its further recitation of terminating the step of depositing when the planarity of the top surface reaches a predetermined degree.

Claims 40, 42 and 44 depend from independent claim 34 and are patentable by their ultimate dependence on independent claim 34 and their further recitation that the characteristic is intensity of the reflected beam of light.

Claim 58 depends from independent claim 52 and is patentable by its dependence on independent claim 52. Claims 41 and 43 depend from independent claim 34 and are patentable by their dependence on independent claim 34. The claims further recite that the characteristic is intensity of the reflected beam of light.

Claims 36-38 depend from independent claim 34 and are patentable by their dependence on independent claim 34 and their further recitation of a material removal step, wherein the step performs chemical mechanical processing, and transmitting and detecting a beam of light indicative of another material on the top surface of the workpiece, respectively.

Claims 47-50 and 65 depend from independent claim 45 and are patentable by their dependence on independent claim 45 and their further recitation of the step of removing at least a portion of the material; wherein the step performs chemical mechanical processing; and transmitting and detecting a beam of light indicative of another material; and wherein the step performs chemical mechanical polishing; and transmitting and detecting a beam of light indicative of another material, respectively.

Claims 55-57 depend from independent claim 52 and are patentable by their dependence on independent claim 52 and their further recitation of a material removal step, wherein the step performs electrochemical mechanical processing, and transmitting and detecting a beam of light indicative of another material on the top surface of the workpiece.

Claim 59 depends from independent claim 52 and is patentable by its dependence on independent claim 52. Claim 59 further recites that the intensity increases as the top surface of the workpiece becomes more planar.

Claim 63 depends from independent claim 34 and is patentable by its dependence on independent claim 34. Claim 64 depends from independent claim 42 and is patentable by its dependence on independent claim 42. Claims 63 and 64 further recite that the intensity increases as the degree of planarization increases.

Claim 39 depends from independent claim 34 and is patentable by its dependence on independent claim 34. Claim 39 further recites that the beam of light and the another beam of light are from a same source.

Claims 60, 61 and 62 depend from independent claim 34 and are patentable by their ultimate dependence on independent claim 34. Claims 60 and 61 further recite the conductor is copper. Claim 62 recites that the another material is a barrier material.

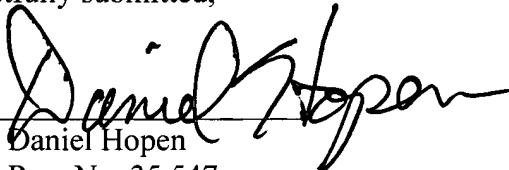
Conclusion

Applicants have addressed the concerns of the Examiner in pointing out and distinguishing the present invention with the prior art. The claims are patentable over the art of record. For these reasons, applicants respectfully request that the Examiner reconsiders and withdraws the rejections of the claims and allows the application. Accordingly, it is respectfully requested that the claims be allowed.

If any matters can be resolved by telephone, applicants request that the Patent and Trademark Office call the applicants at the telephone number listed below.

Respectfully submitted,

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